32. (New) The method of claim 31 wherein said main leaf spring further includes at least one integral mounting end connected with said at least one peripheral arc portion, said at least one mounting end adapted to be connected to a loading structure.

33. (New) The method of claim 31 further comprising the method of separating said main leaf spring from said load plate under empty payload conditions with an intermediary member.

REMARKS

This is a response to the Office Action dated November 13, 2002. Claims 1-30 are pending in the application.

In the Office Action, the Examiner objected to the specification. The Examiner also objected to claims 6, 8, 17 and 18. In addition, claims 15-17 and 29 were rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Further, claims 28-30 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 4,750,718 ("Nickel"). Also, claims 1-5, 7, 12-16, 22-24, and 26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 3,685,8812 ("Buchesky") in view of Nickel, claims 6, 17, and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Buchesky in view of Nickel and U.S. Pat. No. 3,904,300 ("Hetmann"), claims 8 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Buchesky in view of Nickel and U.S. Pat. No. 4,801,129 to Wells ('129 Wells), claims 9, 10, 19, and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Buchesky in view of Nickel and U.S. Pat. No. 4,519,590 to Wells ('590 Wells) (first interpretation), and claims 10, 11, 20, and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Buchesky in view of Nickel and '590 Wells (second interpretation).

With this response, the specification has been amended at the paragraph of lines 2-7 of page 21 to correct the use of claim language in the abstract of the disclosure. Also, claims 6 and 17 were objected to for having the phrase "said a mounting eyelet." This

objection is believed overcome in view of the amendments made to claims 6 and 17. With this response, claims 6 and 17 have been amended to correct typographical errors for clarity and thus not for reasons related to patentability. Claims 8 and 18 were objected to for having the phrase "constructed of same said composite material as said main leaf spring." This objection is believed overcome in view of the amendments made to claims 8 and 18. With this response, claims 8 and 18 have been amended to more clearly recite "said composite material" and thus not for reasons related to patentability since the meaning of the claims have not been changed by their amendments.

Claims 22-24 and 26 were rejected as being obvious Buchesky in view of Nickel. With this response, claims 22-24 and 26 have been cancelled, rendering this rejection moot. Claim 25 was rejected as being obvious over Buchesky in view of Nickel and further in view of Hetmann. With this response, claim 25 has been cancelled, rendering this rejection moot. Claims 28-30 were rejected as being anticipated by Nickel. With this response, claims 28-30 have been cancelled, rendering this rejection moot.

The remaining rejections from the Office Action of November 13, 2002 are discussed below in connection with the various claims. No new matter has been added. Reconsideration of the application is respectfully requested in light of the following remarks.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attachment is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

I. 35 U.S.C. § 112

Claims 15-17 were rejected under 35 U.S.C. § 112, second paragraph as being indefinite because the phrase "a loading structure" first claimed in the last line of claim 15 was believed to be indefinite. Applicants traverse this rejection. The term "a loading structure" is different than "a load plate." Clearly, one of ordinary skill in the art would understand that the two terms are different entities. Support for the claimed invention is found in the specification at least at page 8, line 12, which states that a loading structure, such as a vehicle frame, may be attached at the ends 30 of the main leaf spring. Since the

load plate 40 described in the specification is not attached to the ends 30, it is clear that there is support for "a load plate" being separate from "a loading structure." Accordingly, Applicants request that the Examiner withdraw this rejection of claims 15-17.

II. 35 U.S.C. § 103

a. Independent Claim 1

Independent claim 1 was rejected as being obvious over Buchesky in view of Nickel. Independent claim 1 relates to a variable rate multi-arc leaf spring assembly. The assembly includes a main leaf spring that is constructed of a composite material. The main leaf spring defines an upwardly curved central arc portion having a first radius and at least one pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to said first radius. The main leaf spring provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate.

Neither Buchesky nor Nickel discloses the element of a main leaf spring that defines an upwardly curved central arc portion having a first radius and a pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius. Therefore, the combination of these two references fails to disclose this element.

Moreover, one of ordinary skill in the art would not be motivated to combine Buchesky and Nickel to provide a main leaf spring that provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate by way of an upwardly curved central arc portion having a first radius and a pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius.

Buchesky discloses a spring having two, and only two, portions with different curvatures. Specifically, the spring of Buschesky is formed to have two different radii, one greater than and the other smaller than the radius of a conventional spring having a constant curvature and providing the same roll steering characteristics as the disclosed spring. (Col. 2, ll. 16-29) As a result of this particular geometry, Buchesky teaches that

progressive loading causes the disclosed spring to assume an S-shape. (Col. 2, ll. 49-55, 60-68; Col. 3, ll. 1-6) The disclosed S-shaped spring allegedly permits more latitude in locating the eye mountings at the ends of the spring than a conventional spring. (Col. 2, ll. 16-20; Col. 3, ll. 7-9) In particular, "the front eye mounting [of the disclosed spring] can be raised over the height of the front eye mounting of a conventional leaf spring without sacrificing roll steer characteristics."[1] (Col. 1, ll. 35-39) In this way, the spring of Buchesky allegedly "permits new combinations of rear suspension roll steer and rear spring front eye ground clearance." (Col. 1, ll. 45-48)

Buchesky, however, does not suggest that the disclosed spring can be modified to include an upwardly curved central arc portion and a pair of upwardly curved peripheral arc portions extending from the central arc portion with radii different than the radius of the central arc portion. Nor does Buchesky teach that the disclosed spring achieves a continuous variable spring deformation rate including a soft spring rate and a hard spring rate.

Nickel discloses a dual rate spring construction including a main leaf spring 1 and a secondary leaf spring 2. (Col. 2, ll. 26-30) The main leaf spring 1 of Nickel has end portions that are curved upwardly. (Col. 2, ll. 30-31) Nickel, however, does not teach or suggest a configuration for the main leaf spring 1 that provides a continuous variable spring deformation rate, including a soft spring rate and a hard spring rate. To the contrary, Nickel teaches that the secondary leaf spring 2 is necessary to achieve a dual rate response. In particular, Nickel describes that "when a heavy load is encountered, the main spring will deflect downwardly into contact with the pads 6 [mounted on the ends of the secondary spring] . . . . Continued deflection of the main spring will then cause downward deflection of the secondary spring to achieve the dual rate." (Col. 3, ll. 42-48) Thus, Nickel teaches that the deflection of the main spring 1 downward into engagement with the pads 6 on the secondary spring 2 is responsible for increasing the spring rate. (Col. 1, ll. 51-55) In other words, deflection of the main spring 1 alone achieves a first

[1] Buchesky teaches that "the roll steer produced by a spring assembly can be changed by . . . raising or lowering the eye connections of the springs." (Col. 1, ll. 21-24)

spring rate, whereas the deflection of the main spring 1 and secondary spring 2 together achieves a second spring rate.

Therefore, the Applicants respectfully submit that there is nothing in Buchesky or Nickel to suggest that it would be desirable to make a main leaf spring defining an upwardly curved central arc portion having a first radius and a pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius, wherein the main leaf spring provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate.

Accordingly, Applicants request that the Examiner withdraw this rejection of independent Claim 1.

b. <u>Independent Claim 12</u>

Independent claim 12 was rejected as being obvious over Buchesky in view of Nickel. Independent claim 12 relates to a variable rate multi-arc leaf spring assembly. The assembly includes a main leaf spring that is constructed of a composite material. In the absence of any load, the main leaf spring defines an upwardly curved central arc portion having a first radius and at least one pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius. Under load conditions, the main leaf spring provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate. The assembly further includes a load plate mounted beneath the main leaf spring, wherein the load plate gradually engages the main leaf spring during a predetermined set of payload conditions to enhance the soft spring rate of the main leaf spring.

As discussed above in Section II.a, Buchesky and Nickel, either alone or in combination, fail to teach or suggest a main leaf spring that provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate by way of an upwardly curved central arc portion having a first radius and a pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius.

Moroever, neither Buchesky nor Nickel discloses the element of a load plate mounted beneath a main leaf spring, wherein the load plate gradually engages the main leaf spring during a predetermined set of payload conditions to enhance the soft spring rate. Therefore, the combination of these two references fails to disclose this element.

Buchesky discloses a leaf spring 3 connected to an axle housing using a bracket 9. However, the bracket 9 is mounted above rather than beneath the spring. (Col. 2, ll. 33-34) Furthermore, Buchesky fails to disclose that the spring 3 flexes into engagement with bracket 9 to enhance a spring rate. Rather, Buchesky teaches that under progressive loading the disclosed spring 3 assumes an S-shape and further assumes a position wherein the two portions of the spring have reversed curvatures compared to the no load position. (Col. 2, ll. 50-59) Buchesky thus fails to suggest any motivation for mounting a load plate beneath the disclosed leaf spring. In particular, it would not be obvious to one of ordinary skill in the art to position a load plate beneath the leaf spring of Buchesky because such a load plate would interfere with the bending of the spring to achieve the loading positions described above. That would render the Buchesky spring inoperable for its intended purpose of permitting new combinations of rear suspension roll steer and rear spring front eye ground clearance.

Nickel discloses a leaf spring construction that includes a main leaf spring 1 and a secondary leaf spring 2 connected by a clamping mechanism 3 to an axle mounting bracket 4. (Col. 2, ll. 26-29) Nickel further discloses that "elastomeric pads 6 are mounted on the ends of the secondary spring 2 and project upwardly toward the main spring 1. Under *normal load conditions*, the upper extremity of pads 6 will be spaced *out of contact* with the lower surface of main spring 1." (Col. 2, ll. 47-52) (emphasis added) Accordingly, "when a heavy load is encountered, the main spring will deflect downwardly into contact with the pads 6. (Col. 3, ll. 42-44) Thus, Nickel teaches that there is an abrupt engagement between the main spring 1 and the secondary spring 2 as the main spring deflects into contact with the pads 6 mounted on the end of the secondary spring.

Nickel, however, fails to suggest any motivation for providing a load plate or secondary spring that gradually engages the main leaf spring 1 during a predetermined set of payload conditions to enhance the soft spring rate of the spring. To the contrary, the

Nickel spring construction requires the secondary spring 2 to achieve a dual rate spring rate, as described above. If the main spring 1 were to gradually engage the secondary spring 2, the Nickel spring construction would provide only a single spring rate.

Therefore, the Applicants respectfully submit that there is nothing in Buchesky or Nickel to suggest that it would be desirable to make a variable rate multi-arc leaf spring assembly that includes: 1) a main leaf spring defining an upwardly curved central arc portion having a first radius and a pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius, wherein the main leaf spring provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate; and 2) a load plate mounted beneath the main leaf spring, wherein the load plate gradually engages the main leaf spring during a predetermined set of payload conditions to enhance the soft spring rate.

Accordingly, Applicants request that the Examiner withdraw this rejection of independent Claim 12.

c. Dependent Claims 2-5, 7, 13-16

Dependent claims 2-5, 7, 13-16 were also rejected as being obvious over Buchesky in view of Nickel. These claims depend on either claim 1 or claim 12 and should be allowed for at least the same reasons as set forth for the independent claims above in Sections II.a-b.

Accordingly, Applicants request that the Examiner withdraw this rejection of dependent claims 2-5, 7, 13-16.

d. Dependent Claims 6, 17

Dependent claims 6, 17 were also rejected as being obvious over Buchesky in view of Nickel and further in view of Hetmann. These claims depend on either claim 1 or claim 12. Since Hetmann does not cure the deficiencies of Buschesky and Nickel set forth in Sections II.a-b, the rejection is inappropriate for reasons similar to those given in Sections II.a-b.

In particular, Hetmann discloses an elastic joint for interconnecting steering linkage sections. (Col. 1, ll. 7-8) However, Hetmann does not disclose or suggest modifying Buchesky to include: 1) a main leaf spring defining an upwardly curved central arc portion having a first radius and a pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius, wherein the main leaf spring provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate; or 2) a load plate mounted beneath the main leaf spring, wherein the load plate gradually engages the main leaf spring during a predetermined set of payload conditions to enhance the soft spring rate. Without such suggestions, dependent claims 6, 17 should be allowed for at least the same reasons as set forth for the independent claims above in Sections II.a-b.

Additional limitations of these dependent claims also distinguish over the cited references. For example, none of the references disclose that "said mounting eyelet includes an out-of-mold metallic insert for installation" as recited in Claims 6, 17, as amended. In particular, Buchesky discloses that "eyes at the end of spring 3 are connected by bracket and bushing devices 5 that pass therethrough to the frame members 7 of the vehicle." (Col. 2, ll. 30-33) Buchesky, however, does not disclose a leaf spring constructed of a composite material or an insert for a mounting eyelet integral with the spring. Nickel discloses the use of a fiber reinforced resin leaf spring. (Col. 2, ll. 34-38). Hetmann discloses a metallic sleeve 6 that is inserted in bore 4 of elastic bushing 3 and is joined to the elastic bushing by means of vulcanizing. (Col. 3, ll. 51-54, 62-64) However, none of these references suggest any motivation for providing an out-of-mold metallic insert for a mounting eyelet of a composite spring.

Accordingly, Applicants request that the Examiner withdraw this rejection of dependent claims 6, 17.

e. <u>Dependent Claims 8, 18</u>

Dependent claims 8, 18 were also rejected as being obvious over Buchesky in view of Nickel and further in view of '129 Wells. These claims depend on either claim 1 or claim 12. Since '129 Wells does not cure the deficiencies of Buschesky and Nickel set

forth in Sections II.a-b, the rejection is inappropriate for reasons similar to those given in Sections II.a-b.

In particular, '129 Wells discloses a leaf spring clamp for securing the position of a leaf spring in a suspension system, including an upper member or clamp base 30 and a lower member or clamp plate 40 for sandwiching a leaf spring 50 between them. (Col. 1, ll. 6-7; Col. 5, ll. 1-4) However, '129 Wells does not disclose or suggest modifying Buchesky to include: 1) a main leaf spring defining an upwardly curved central arc portion having a first radius and a pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius, wherein the main leaf spring provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate; or 2) a load plate mounted beneath the main leaf spring, wherein the load plate gradually engages the main leaf spring during a predetermined set of payload conditions to enhance the soft spring rate. Without such suggestions, dependent claims 8, 18 should be allowed for at least the same reasons as set forth for the independent claims above in Sections II.a-b.

Additional limitations of these dependent claims also distinguish over the cited references. For example, since none of the references disclose "a load plate" as recited in claims 1, 12, the references also fail to disclose "said load plate is constructed of said composite material," as recited in Claims 8, 18. Therefore, Applicants respectfully submit that there is nothing in '129 Wells or Buchesky or Nickel to suggest that it would be desirable to make a load plate that is constructed of the same composite material as the main leaf spring.

Accordingly, Applicants request that the Examiner withdraw this rejection of dependent claims 8, 18.

f. <u>Dependent Claims 9, 10, 19, 20</u>

Dependent claims 9, 10, 19, 20 were also rejected as being obvious over Buchesky in view of Nickel and further in view of U.S. Pat. '590 Wells (first interpretation). These claims depend on either claim 1 or claim 12. Since '590 Wells does not cure the

deficiencies of Buschesky and Nickel set forth in Sections II.a-b, the rejection is inappropriate for reasons similar to those given in Sections II.a-b.

In particular, '590 Wells discloses an axle clamp comprising: 1) a clamp base 1 forming a channel that receives a composite material leaf spring 10 and a wedge insert 2, which is inserted between the spring and the leaf spring; and 2) a clamp plate 12 mounted above the leaf spring and the clamp base 1 and a resilient upper pad 11 positioned between the leaf spring and the clamp plate. (Col. 4, ll. 32-63; Col. 5, ll. 38-43) However, '590 Wells does not disclose or suggest modifying Buchesky to include: 1) a main leaf spring defining an upwardly curved central arc portion having a first radius and a pair of upwardly curved peripheral arc portions extending from the central arc portion and having radii not equal to the first radius, wherein the main leaf spring provides a continuous variable spring deformation rate including a soft spring rate and a hard spring rate; or 2) a load plate mounted beneath the main leaf spring, wherein the load plate gradually engages the main leaf spring during a predetermined set of payload conditions to enhance the soft spring rate. Without such suggestions, dependent claims 9, 10, 19, 20 should be allowed for at least the same reasons as set forth for the independent claims above in Sections II.a-b.

Additional limitations of these dependent claims also distinguish over the cited references. For example, since none of the references disclose "a load plate" as recited in claims 1, 12, the references also fail to disclose that "said load plate defines a uniform cross-sectional area throughout its length," as recited in Claims 9, 19; and that "an intermediary member spaced between said leaf spring and said load plate," as recited in claims 10, 20. Therefore, Applicants respectfully submit that there is nothing in '590 Wells or Buchesky or Nickel to suggest that it would be desirable to make a load plate that defines a uniform cross-sectional area throughout its length or to position an intermediary member spaced between a leaf spring and a load plate.

Accordingly, Applicants request that the Examiner withdraw this rejection of dependent claims 9, 10, 19, 20.

g. **Dependent Claim 10, 11, 20, 21**

Dependent claims 9, 10, 19, 20 were also rejected as being obvious over Buchesky in view of Nickel and further in view of '590 Wells (second interpretation). These claims depend on either claim 1 or claim 12. Since, as discussed above in Section II.f, '590 Wells does not cure the deficiencies of Buschesky and Nickel set forth in Sections II.a-b, the rejection is inappropriate for reasons similar to those given in Sections II.a-b.

Additional limitations of these dependent claims also distinguish over the cited references. For example, since none of the references disclose "a load plate" as recited in claims 1, 12, the references also fail to disclose that "an intermediary member spaced between said leaf spring and said load plate," as recited in claims 10, 20; and that "said intermediary member is constructed of urethane," as recited in Claims 11, 21. Therefore, Applicants respectfully submit that there is nothing in '590 Wells or Buchesky or Nickel to suggest that it would be desirable to position an intermediary member spaced between a leaf spring and a load plate or to make such an intermediary member that is constructed of urethane.

Accordingly, Applicants request that the Examiner withdraw this rejection of dependent claims 10, 11, 20, 21.

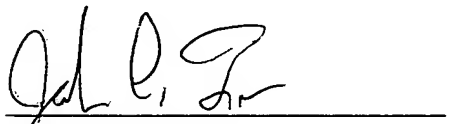
III. New Claims

New claims 31-33 have been added to correct several statements made in original claims 28-30 that were obviously made in error after a review of Applicants' specification. Since the cancellation of claims 28-30 and the addition of claims 31-33 clarify Applicants' method of achieving a continuous non-linear variable spring deformation rate for a multi-arc leaf spring assembly, the new claims 31-33 are not presented for reasons related to patentability as defined by *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 122 S.Ct. 1831, (2002).

CONCLUSION

Each of the rejections in the Office Action dated November 13, 2002 has been addressed and no new matter has been added. Applicants submit that all of the pending claims are in condition for allowance and notice to this effect is respectfully requested. The Examiner is invited to call the undersigned at (312) 321-4262 if it would expedite the prosecution of this application.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

(Amended) Page 21, lines 2-7:

In one aspect of the invention, a variable rate multi-arc leaf spring assembly is provided. The assembly includes a main leaf spring that is constructed of a composite material and defines [a] an upwardly curved central arc portion having a first radius and at least one pair of upwardly curved peripheral arc portions extending from the central arc portion and having [a second radius] radii not equal to the [said] first radius. The main leaf spring provides a continuous non-linear variable spring deformation rate.

In the Claims:

1. (Amended) A variable rate multi-arc leaf spring assembly comprising:

a main leaf spring constructed of a composite material, said main leaf spring defining [a] an upwardly curved central arc portion having a first radius and at least one pair of upwardly curved peripheral arc portions extending from said central arc portion and having [a second radius] radii not equal to said first radius,

wherein said main leaf spring provides a continuous [non-linear] variable spring deformation rate including a soft spring rate and a hard spring rate.

6. (Amended) The variable rate multi-arc leaf spring assembly of claim 5 wherein said [a] mounting eyelet includes an out-of-mold metallic insert for installation.

7. (Amended) The variable rate multi-arc leaf spring assembly of claim 1 further comprising a load plate [, said load plate adjacent said leaf spring] mounted beneath said main leaf spring, wherein said load plate gradually [continuously] engages said main leaf spring during a predetermined set of payload conditions to enhance said [continuous non-linear variable spring deformation rate] soft spring rate.

8. (Amended) The variable rate multi-arc leaf spring assembly of claim 7 wherein said load plate is constructed of [same] said composite material [as said main leaf spring].

12. (Amended) A variable rate multi-arc leaf spring assembly comprising:

a main leaf spring constructed of a composite material, said main leaf spring defining [a] an upwardly curved central arc portion having a first radius and at least one pair of upwardly curved peripheral arc portions extending from said central arc portion and having [a second radius] radii not equal to said first radius, wherein said main leaf spring provides a continuous [non-linear] variable spring deformation rate including a soft spring rate and a hard spring rate; and

a load plate [, said load plate adjacent said leaf spring] mounted beneath said main leaf spring, wherein said load plate gradually [continuously] engages said main leaf spring during a predetermined set of payload conditions to enhance said [continuous non-linear variable spring deformation rate] soft spring rate.

17. (Amended) The variable rate multi-arc leaf spring assembly of claim 16 wherein said [a] mounting eyelet includes an out-of-mold metallic insert for installation.

18. (Amended) The variable rate multi-arc leaf spring assembly of claim 12 wherein said load plate is constructed of [same] said composite material [as said main leaf spring].